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Datasheet	
Type:	LCD-1602B
Rev.:	V1.0

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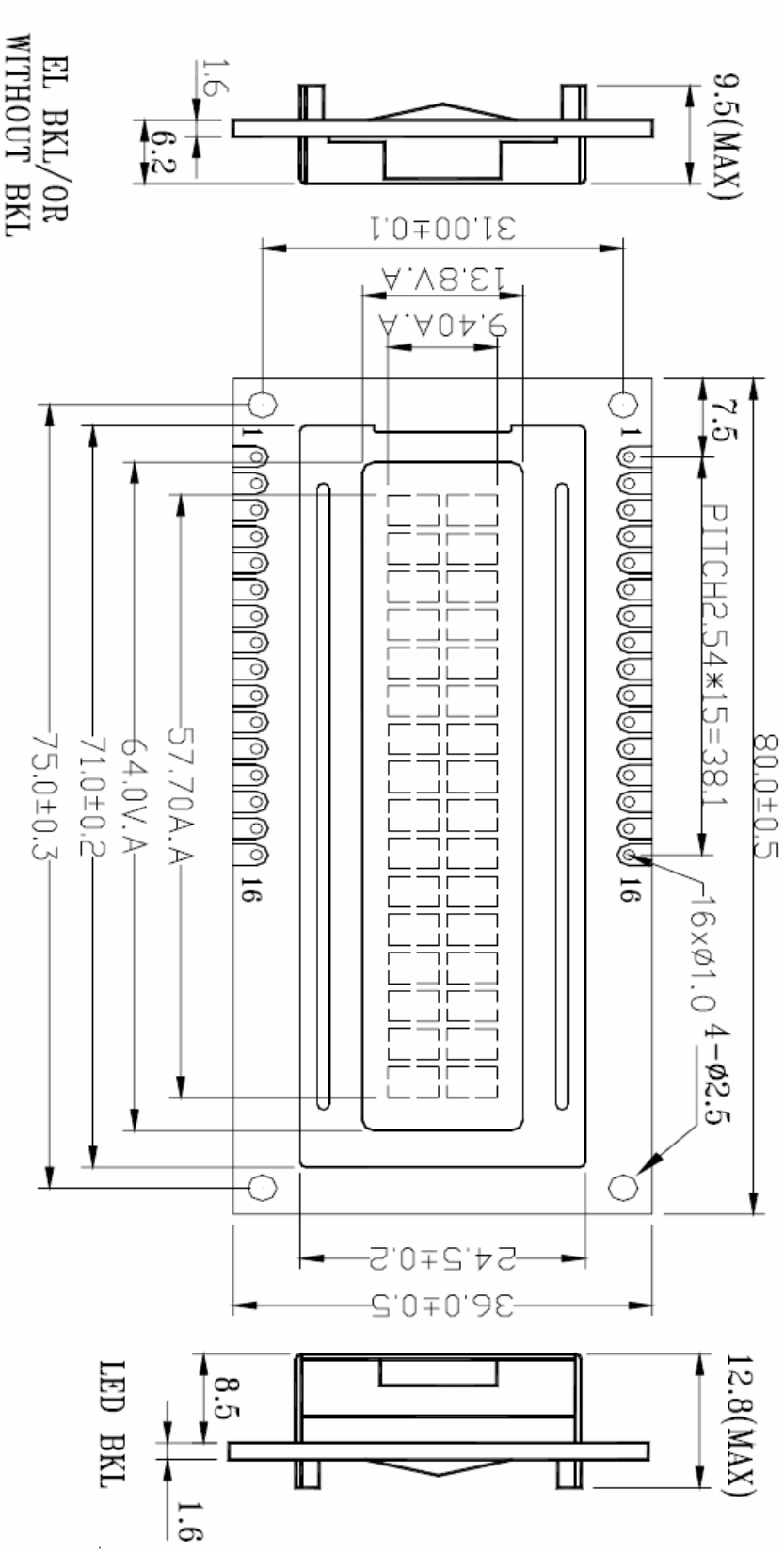
Contents

Mechanical Diagram



PERFORMANCE FEATURES	
LC FLUID:	STN
SUPPLY VOLTAGE:	VDD=5.0V
POLARIZER:	REFLECTIVE/TRANSFLECTIVE
VIEWING ANGLE:	6:00
COLOR:	BLUE
BACKLIGHT:	LED
TEMPERATURE RANGE:	0°C TO 50°C

PIN	1	2	3	4	5	6	7	8
SIGNAL	VSS	VDD	V0	RS	R/W	E	DB0	DB1
PIN	9	10	11	12	13	14	15	16
SIGNAL	DB2	DB3	DB4	DB5	DB6	DB7	A	K

TOLERANCES UNLESS OTHERWISE SPECIFIED ±0.1

Absolute Maximum Ratings

Item	Symbol	Min	Max	Unit
Power Voltage	V_{DD}-V_{ss}	0	7.0	V
Input Voltage	V_{in}	V_{ss}	V_{DD}	
Operating Temperature Range	T_{op}	0	+50	°C
Storage Temperature Range	T_{ST}	-20	+60	

Description Of Terminals

Pin No.	Pin Name	Input/ Output	External Connection	Function
1	VSS	-	Power Supply	VSS:GND
2	VDD	-		VDD: +5V
3	VO	-		V_{LCD} adjustment
4	RS	Input	MPU	Register select signal ”0”: instruction register (when writing) Busy flag & address counter (when reading) “1”: Data register (when writing & reading)
5	R/W	Input	MPU	Read/Write select signal “0” for writing, “1” for reading
6	E	Input	MPU	Operation (data read/write) enable signal
7 / 10	DB0-DB3	Input	MPU	Low-order lines of data bus with 3-state, Bi-directional function for use in data transaction with the MPU. These lines are not used when interfacing with a 4-bit microprocessor.
11 / 14	DB4-DB7	Input	MPU	High-order lines of data bus with 3-state, Bi-directional function for use in data transactions with the MPU. DB7 may also be used to check the busy flag.
15	A		LED+	Voltage Typ. 4.2V, Max. 4,5V
16	K		LED-	

Optical Characteristics

For STN Type Display Module (T_a=25°C, V_{DD}=5.0V±0.25V)

Item	Symbol	Condition	Min,	Typ.	Max.	Unit
Viewing angle	θ	C_r≥2	-60	-	35	deg
	Φ		-40	-	40	
Contract ratio	C_r		-	6	-	-
Response time(rise)	T_r	-	-	150	250	Ms
Response time(fall)	T_r	-	-	150	250	ms

Electrical Characteristics

DC Characteristics

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Supply voltage for LCD	V_{DD}-V_O	T_A=25°C	-	4.6	-	V
Input voltage	V_{DD}		4.7	-	5.5	V
Supply current	I_{DD}	V_{DD}=5.0V; T_A=25°C	-	1.5	2.5	mA
Input leakage current	I_{LKG}		-	-	1.0	µA
”H” level input voltage	V_{IH}		2.2	-	V_{DD}	V
”L” level input voltage	V_{IL}	Twice initial value or less	0	-	0.6	V
”H” level output voltage	V_{OH}	L_{OH}= -0.25mA	2.4	-	-	V
”L” level output voltage	V_{OL}	L_{OL}=1.6mA	-	-	0.4	V
Backlight supply power	V_F		-	4.2	4.5	V

AC Characteristics

Read Cycle (V_{DD}=5.0V+10%, V_{SS}=0V, T_a=25°C)

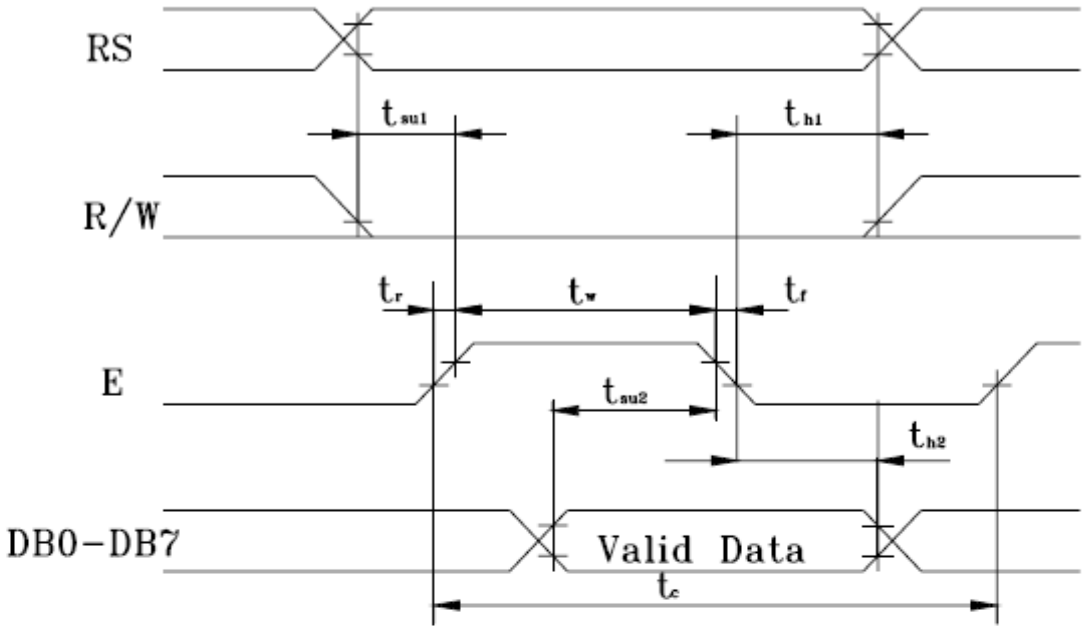
Parameter	Symbol	Test Pin	Min.	Typ.	Max.	Unit
Enable cycle time	T_C	E	500	-	-	ns
Enable pulse width	T_W	E	300	-	-	
Enable rise/fall time	T_R,T_f	E	-	-	25	
RS, R/W setup time	T_{SU}	RS; R/W	100	-	-	
RS, R/W address hold time	T_h	RS; R/W	10	-	-	
Read data output delay	T_D	DB0-DB7	60	-	190	
Read data hold time	T_{DH}	DB0-DB7	20	-	-	

Write Cycle

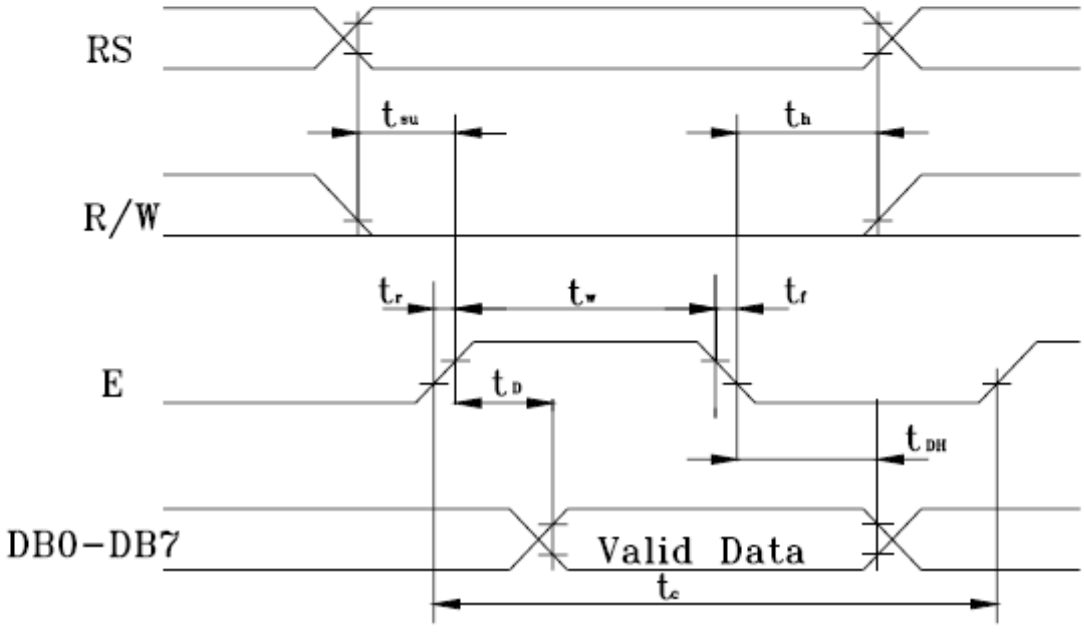
Parameter	Symbol	Test Pin	Min.	Typ.	Max.	Unit
Enable cycle time	T_C	E	500	-	-	ns
Enable pulse width	T_W	E	300	-	-	
Enable rise/fall time	T_R,T_f	E	-	-	25	
RS, R/W setup time	T_{SU1}	RS; R/W	100	-	-	
RS, R/W address hold time	T_{h1}	RS; R/W	10	-	-	
Data setup time	T_{SU2}	DB0-DB7	60	-	-	
Data hold time	T_{h2}	DB0-DB7	10	-	-	

Timing Characteristics

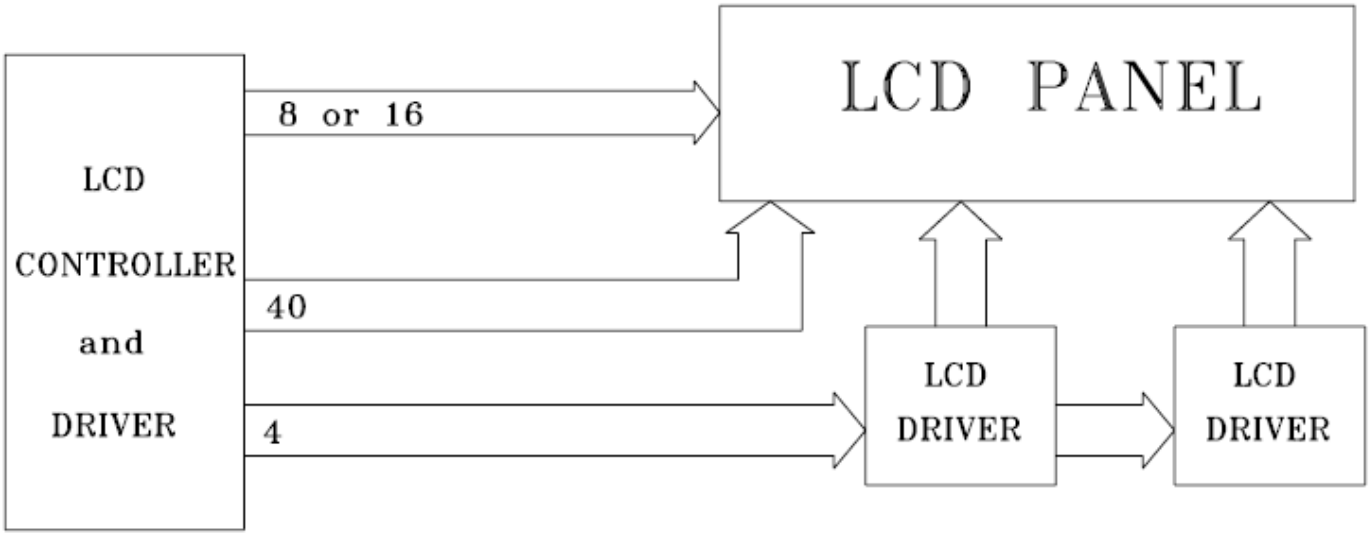
Write Timing

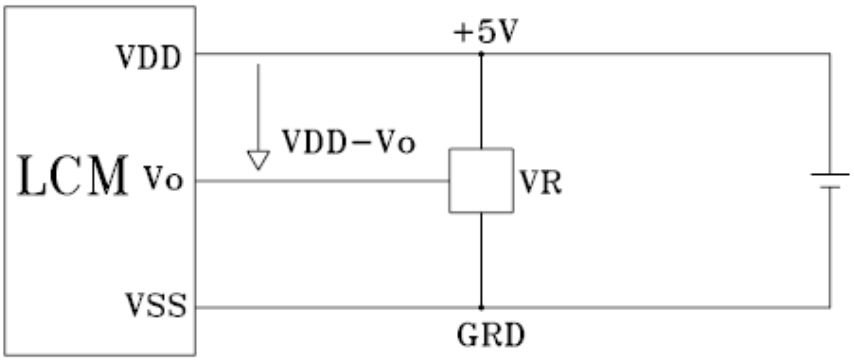


Read Timing



Block Diagram





VDD-V0: LCD Driving Voltage
VR: 10K-20K Ω

Display Command

Parameter	RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	Note	Executing time Fosc=250kh
Clear Display	0	0	0	0	0	0	0	0	0	1		1.64ms
Cursor home	0	0	0	0	0	0	0	0	1	*		1.64ms
Entry Mode Set	0	0	0	0	0	0	0	1	1/D	S	DB1=1:Increment DB1=0:Dectrement DB0=0:The display is not shifted	40µs
Display On/Off	0	0	0	0	0	0	1	D	C	B	DB2=1 Display on DB2=0:Display off DB1=1:Cursor on DB1=0:Cursor off DB0=1:Brinking on DB0=0:Brinking off	40µs
Cursor/Display Shift	0	0	0	0	0	1	S/C	R/L	*	*	DB3=1:Shift display one character DB2=1:Right shift DB2=0:Left shift	40µs
System Set	0	0	0	0	1	DL	N	F	*	*	DB4=1:8 bits DB4=0:4 bits DB3=1:2 lines display(1/16 duty) DB3=0:1 line display DB2=1:5 x 10 dots, 1/11 duty DB2=1:5 x 7 dots, 1/8 duty	40µs
Set CG RAM Address	0	0	0	1	CG RAM address corresponds to cursor address						The address lenth that can be set is 64 address	40µs
Set DD RAM Address	0	0	1	DD RAM address							The address lenth that can be set is 80 address	40µs
Read Busy Flag/Address Counter	0	1	BF	Address counter used for both DD&CG RAM address							DB7=1:Busy (instruction not accepted) DB7=0:Ready (for instruction)	0µs
Write Data	1	0	Write data									46µs
Read Data	1	1	Read data									46µs

DD RAM Address:

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Address for line 1	00	01	02	03	04	05	06	07	08	09	A	B	C	D	E	F
Address for line 2	40	41	42	43	44	45	46	47	48	49	4A	4B	4C	4D	4E	4F

Standard Character Pattern

Note: The user can specify any pattern for character-generator RAM.

Reliability and Life Time

Reliability Test

Storage Condition	Content	Evaluations and Assessment*			
		Current consumption	Oozing	Contrast	Other appearances
Operation at high temperature and humidity	40°C, 90% RH, 240hrs	Twice initial value or less	None	More than 80% of initial value	No abnormality
High temperature storage	60°C, 240hrs	Twice initial value or less	none	More than 80% of initial value	No abnormality
Low temperature storage	-20°C, 240hrs	Twice initial value or less		More than 80% of initial value	No abnormality

*Evaluations and assessment to be made two hours after returning to room temperature (25°C±5°C)
*The LCDs subjected to the test must not have dew condensation.

Liquid crystal panel service life

50,000 hours minimum at 25±10°C, 45±20% RH.